**Salisbury University**

Seidel School of Education and Professional Studies

Department of Teacher Education

Spring 2009

**ELED-312: Science Instruction**

Teacher Education & Technology Center (TETC), Room 182 (and other places as announced)

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**Office Hours:** Usually right after class (except Tuesdays), but appointments are best. See schedule outside my door, please.

**Course Goal**

In this course you will learn the initial skills necessary to teach inquiry-based science effectively to diverse learners in the elementary and middle school. This is a reform-based class, which means that what you learn may, in some cases, be different from what you experienced in the past or observe in current classrooms. It is important that you are open to changing your ideas about science, teaching science, children, and yourself. As a teacher, YOU are the most important agent of positive change in schools. You must work to prepare yourself for that role. If you are energized by the potential of that role, you will do well in this course.

**Required Resources**

Martin, D. J. (2008). *Elementary Science Methods: A Constructivist Approach.* (5th edition)

Belmont, CA: Thomson/Wadsworth.

A composition book (marbled cover) for your own “Science Notebook” (we’ll discuss this, there are other options, so wait to purchase this until I describe its use.)

LiveText subscription (you may already have this from previous semesters at SU)

**Additional Materials**

There are many materials on reserve in the Blackwell Library and/or the TETC Resource Center for your use. Ask to see the reserve list under my name. There will also be some cost for materials you use in projects for the course**.** In particular, you will be paying a fee of $25 for registration to an environmental education seminar at which you’ll get a book of activities for use in your teaching. Plan to spend around $50 on materials. Consider this as being no different from another text or other required resource for the course.

**Note**

The requirements and policies on this syllabus are tentative and can be changed in advance of due dates at the instructor’s discretion to address emergent needs of the course and students.

**Regarding LiveText**

We will be using LiveText in this class this semester. You are expected to maintain an electronic portfolio on LiveText throughout the duration of the Elementary Education program. At the conclusion of the elementary program, in ELED 411, you will be expected to select items for inclusion in the portfolio that demonstrate your achievement of the outcomes set by the Association for Childhood Education International (ACEI).

For this course, you will hand in at least one science lesson plan (your Core # 3 lesson plan) on LiveText, and perhaps other assignments.

**Specific Course Outcomes:** Through the activities of this course, the prospective teacher will:

1. *(National and State Standards)*

Understand and apply the National Science Education Standards and the MD Content Standards for Science. (Professional Development and Collaboration)

2. *(Constructivism)*

Develop an understanding of constructivism as it relates to science teaching and learning. (Focus on Student Learning)

3. *(Diverse Learners)*

Develop an awareness of the needs of diverse learners and practice strategies to support them (e.g. inquiry learning, questioning, cooperative learning). (Enhanced Student Learning)

4. *(Science as Inquiry)*

Experience science as a form of inquiry through which one makes sense of the natural world. (Scholarship)

5. *(Developmentally Appropriate Planning and Assessment)*

Learn to plan and assess inquiry based science instruction that is developmentally appropriate both in and out of the classroom. (Enhanced Student Learning)

6. *(Familiarity with Resources)*

Learn to locate and utilize resource materials to teach inquiry based science lessons (e.g. professional journals, curriculum guides, electronic sources). (Informed & Reflective Pedagogy)

7. *(Curriculum Integration)*

Demonstrate the ability to plan instruction that integrates science across curricular areas. (Enhanced Student Learning)

8. *(Research Base)*

Become aware of the research base that supports current practices in science education. (Scholarship)

9. *(Alternative Assessment Strategies)*

Develop a repertoire of alternative assessment strategies to employ in evaluation if knowledge and skills in science content and process. (Scholarship)

10. *(Locating Appropriate Activities)*

Develop and be able to use criteria related to student considerations, such as motivation, engagement, and development, as well as curricular issues for selecting and adapting activities for science instruction. (Enhanced Student Learning)

11. *(Technology)*

Explore the use of electronic technology to enhance science instruction. (Informed & Reflective Pedagogy)

12. *(Professionalism* & *the Reform of Science Education)*

Understand the individual professional's role in reform and potential as a change agent relative to current trends in science education. (Collaboration)

13. *(Community Connections)*

Identify ways that classroom teaching can be linked with other formal and informal learning opportunities in the community (e.g. through service learning). (Collaboration)

14. *(Effective Teaching Across Grades)*

Develop the ability to plan for science instruction using best practice models at all grade levels covered by elementary teaching certification in MD (i.e. typically grades 1-8). (Informed & Reflective Pedagogy)

**Course Policies**

*Note: Exceptions to the policies that follow, though rare, are possible. They will usually be made only by prior arrangement, and are always reserved for very special circumstances, and with verification. While I want to be understanding, I also must be fair to those who do follow through as required.*

**Attendance:** Attendance is required. A late arrival or an early departure from class equal to or in excess of ten minutes will be considered an absence (but you are still better off coming late rather than not coming to class at all.)You may miss one class without an explicit penalty, but I do notice. More than one absence may result in a deduction in the overall course grade of as much as 10% of the final total. In keeping with SU policy, there are no excused absences. Exceptions to this policy are rare and are usually given only when the absence can be verified as essential (e.g., for medical or other emergency reasons.)

**Punctuality:** Assignments are due in class, at the beginning of class on the day they are due. They are late if not handed in by you when I ask for them-and/or if you are late to class. If you must be absent from class on a due date, you must arrange for your assignment to be in on time. Late assignments will be accepted at the instructor's discretion (which means that they may not be accepted—it’s up to me). Core assignments are usually NOT accepted late. Any **late** **assignments will usually be reduced no less than 10% per day**, beginning after class on the day it is due. All assignments must be handed in during class or to me directly at a later time. Do not hand in assignments to others, and do not leave them for me in my office or mailbox unless I tell you to do so.

**Grading:** Grades are on a 10% scale, and are structured in keeping with SU policy (see "Undergraduate Grading System" in the SU catalog):

90-100 = A Excellent (Superior achievement; outstanding performance)

80-89 = B Very good (High achievement; a mark of distinction)

70-79 = C Satisfactory (Adequate achievement)

60-69 = D Passing (Marginal achievement; minimal exposure to the principles and techniques)

-59 = F Failure

R = Resubmit (Re-do the assignment and resubmit both copies at the next class session. Your resubmission will be considered LATE. Resubmissions are not always allowed, but generally are called for in the case of incomplete or exceedingly poor quality work.)

**Assignments:** Generally, work that meets minimum expectations receives a grade of 80-85%. That should be considered a very good grade. Work that exceeds minimum expectations by incorporating the student's personal ideas, interests, priorities, and so on in constructive ways and that demonstrates heightened levels of engagement and professionalism will be regarded as superior, or even excellent. Do not expect to get an "A" for doing only what is minimally expected. You are graded for the abilities you demonstrate in your work.

In general, I look for an excuse to mark things as exceeding minimum expectations, but you must give me that excuse in your work. Usually, an assignment that exceeds basic expectations in some area(s) will not receive an “A” unless it at least meets minimum expectations in all areas. It is possible for an assignment that exceeds minimum expectations in one or two area(s) to earn a "C" or below if it does not meet minimum expectations in other areas.

**Assignment Format:** Be neat. All assignments must be turned in typed on white paper in a 12 pt. font and double-spaced (so there is room for comments). Please use standard fonts such as “Times New Roman” or “Arial” Do NOT use a cover page. In the upper right-hand corner always include a heading:

**Your** **name**

**Assignment title and part** from the syllabus (this should be exactly what the syllabus says)

**Your course and section number**

**Date** it is handed in

Staple the pages together in the upper left corner. Do not use clips, folded corners, page covers or report covers. Assignments that are not formatted properly may be returned ungraded (“R”).

**Core Assignments:** The "Core Assignments" are the most demanding, and are the most important in terms of becoming a professional. You must pass all "Core Assignments" to pass the class, regardless of your overall point total. Note that you can intern only if you have a grade of “C”or better in all methods courses.

**General Quality:** You are in a professional program. All work should reflect your best effort as a pre-service professional. If it seems to me that it does not, I may hand it back ungraded with any Resubmission (if allowed) being considered late. Your work in this class is also a reflection of your sincerity about wanting to become a teacher. Let your commitment to your chosen profession shine through on assignments, in class and in all of your dealings with others. At my discretion, sub-standard work may simply be issued a failing mark.

**Substance:** Note that you are graded for your demonstrated ability as a pre-service teacher. You will do best if you work in a smart manner, not long or hard. There are no bonus points for working late at night or spending long hours on something. It is the product that is the demonstration of your ability. Pay attention to substance, and decorate substantial work if you wish. Be careful not to let decoration replace substance.

**Originality:** Focus on the intent of the assignment, and the stated requirements. Then, look for areas of flexibility that may be exploited to let your particular abilities and interests shine through. THAT is what will be considered great work. The best work is unique to the student who made it. Taking risks is a good thing and will be rewarded to the extent that they demonstrate serious engagement with issues of teaching.

**Citations:** In all cases I expect that the work you hand in on individual assignments is done by you alone, has not been used in part or in whole for any other course, and cites all third-party sources that you use. This includes Internet sources. You should ALWAYS CITE where you got your ideas. Any use of material without a complete citation will be considered plagiarism.

**Using Your Own Work and “Double Dipping” Assignments:** The expectation of originality includes, but is not limited to, use of your own work that is not originally done for this course. You should not use all or part of an assignment from another class without telling me, whether that class is happening now or is from the past. For example, even though you may find a topic for your field placement lesson that could work for two methods classes, you must not use the same lesson plan (or even the same activity written up differently) for two classes unless it is OK’d by BOTH instructors in advance. This is known as “double dipping” an assignment, and is not allowed in this class. Unapproved “double dipping” is considered cause for failure on the assignment.

**Copies of Your Course Work:** Always keep an electronic copy of every assignment. You will need this for your electronic portfolio, but also if we disagree whether or not I've seen it. (Also, whenever possible, try to get digital photographs of yourself presenting assignments for your portfolio.) Note, as is typical in professional programs, copies of some or all of your assignments will be kept for various departmental purposes. These may include faculty and course assessment, departmental review, and/or program accreditation. You will not be informed that your work is being used for these purposes. If there is an assignment that you do not want kept for this use, you may let me know.

**Make-up Exams:** All make-up exams, if allowed at all, are essays. They must be arranged in advance, unless you can demonstrate that you had a medical emergency (not just illness) that kept you from class.

**Communication:** I am always happy to discuss your work in the class with you. There will be several avenues for getting in touch with me. You may e-mail me at any time, call, or stop by my office. I try to keep office hours, but making an appointment will help make sure I'm available for you. Please keep in touch so that I know of any issues before they become frustrations, and so that I can also share in what you find interesting and worthwhile. If you do need to reach me, do not depend on leaving messages, or on my returning your calls (it may be that I am not getting the messages.) Keep trying to reach me.

*Core Assignment # 1: Jumping In Presentation*  50 points

Sometimes there's no better way to learn than to "jump right in" and try something. With that in mind, you will work in a group to prepare a presentation for the class to be given in the first few weeks of the course. The focus of this assignment is for you to begin learning how to engage learners in inquiry-based activities, and how to effectively teach using inquiry-based methods.

You will be given the basic information about how to do the activity you will present, and some of the basic materials for the activity. You will need to work with your group to:

1. Develop an **engaging way** to get your classmates involved in the activity.
2. Identify relevant **standards from the MD Voluntary Curric**ulum and maintain focus on those during the presentation.
3. Identify at least **one electronic resource** that is supports the outcomes of your lesson and add it to the class social bookmarking site (you’ll be introduced to this in class.)
4. Prepare for the presentation so that it has the three primary attributes of inquiry (memorize these now)
   1. focus on a **relevant question** that can be answered with evidence
   2. rely on evidence that is gathered by **students using science processes**
   3. use **an inductive approach** in building knowledge – letting evidence precede explanation
5. You should have an **activity page** to facilitate the presentation (this will be used in the Explore portion.)
6. Make sure each group member has an **active role in the presentation**.
7. Plan ahead for effective **materials management** during the presentation.
8. After the presentation, you will write an **individual reflection** in the "What?, So What?, Now What?" format. This should be turned in at the beginning of the next class after you present.

Major Course Outcomes Addressed Are:

1. You will identify the MD Voluntary Curriculum Standards that relate to your activity.

2. Maintain a constructivist approach by focusing on student ideas as you present the activity.

4. The three key attributes of inquiry will be included in the presentation.

11. Engagements may make use of technology such as PowerPoint, United Streaming Video, etc.

**Hand In:**

*Prior to presenting on the day you present:* Presentation Plan

--An annotated write up of the activity listing relevant MD Voluntary Standards as well as your plan for the presentation. This should describe the Engagement, as well as the activity itself (the Exploration) as you finally decide to go about it with your group. The write up should point out key steps in the activity, along with things to remember along the way (e.g., when to pass things out, when not to say something), and who is to do what. The specific format you use is not important, but it should demonstrate careful planning. It will help me to identify ways that you earned points for the assignment. This will be due when you begin your presentation.

*After presenting on the next class period: Reflection Paper*

Use the “What?”, “So What?”, “Now What?” format to write an individual Reflection which is due the next class after presenting your material.

Essentially, you should be answering the question, “How did this experience help me to improve my abilities to teach children?”

**“What happened?”** – In this you should address the planning of the activity and the presentation itself.

**“So What?”** – So, what was the significance of that? Discuss things that you learned, things that surprised you, and things that delighted you.

**“Now What?” –** Now, what willthis mean for your later teaching?

**Note:** The above “What?, So What?, Now What?” format will be the format for all reflections in this class unless you are told otherwise for a specific assignment.

*Core Assignment #2: Science Inquiry Activity and Display 100 points* This is an opportunity to take a science activity and make it your own by rewriting it as an inquiry-based lesson. You will also have the opportunity to visit and work at the Wicomico County Instructional Resource Center, an important source for teachers to make lesson materials.

Major Course Outcomes Addressed Are:

1. Preparing this lesson plan will help you gain proficiency at identifying relevant standards.

2. The 5-E model places the learner's ideas as the focus of teaching, which is fundamental to constructivism.

3. In preparing the lesson, you will focus attention on how the needs of diverse learners can be addressed.

4. The 5-E model supports inquiry-based instruction by emphasizing the role of inductive teaching.

5. You will discuss how the students’ naïve conceptions will inform the lesson development.

6. You will identify companies from which specific materials can be ordered for science instruction.

10. Candidates will use resources such as those on reserve at the library to choose an appropriate activity.

11. Candidates will utilize teacher resources at the Wicomico County Staff Development Center.

12. Depending on how the lesson is developed, technology may be used at various points (e.g., “Engagement”).

13. The attributes of the 5-E model are consistent with reform-based priorities in science education.

14. In planning for a particular grade level, candidates must consider how those students differ from students at

other grade levels.

This project will be focused on altering an activity you find (either online or in print) so as to make it an **inquiry-based activity,** and creating an interactive **visual display** to accompany it the activity.

1. Find a published science activity (online or in print) that you recognize as **missing** one or more elements of an inquiry-based lesson. Those elements of inquiry are:
   * 1. focus on a **relevant question** that can be answered with evidence
     2. rely on evidence that is gathered by **students using science processes**
     3. use **an inductive approach** in building knowledge – letting evidence precede explanation
2. Consider how you can **change the activity** by re-developing it to include all elements of an inquiry-based activity.
3. Identify how the activity can be used to address **standards within the Maryland Voluntary State Curriculum** (MD VSC).
4. Structure an approach to presenting the **activity within a lesson**, specifically consistent with the “5-E Model” that you will learn in class. You will alter the found activity so it will work as the Explore part of the 5-E plan and develop a lesson plan for that activity.
5. Develop a 1-2 page explanation of the **science background** that someone would need to know (i.e. the concepts) in order to teach the lesson well. **Sources will be cited** for the lesson idea and for the science background explanation.
6. Design and construct an interactive visual display to accompany the lesson. The fundamental rationale for this is that visual displays provide a “presence for science” in the classroom, even when science is not being taught directly. We’ll talk about why that is important. There are several options for these displays. I will list three here. If you have another idea, feel free to check it with me (before beginning, please.) These will be displayed in our classroom, in the display case outside the classroom and/or in the TETC Resource Center. Options include:
   1. A 3x4 ft. bulletin board (it is best if it is 4ft. tall and 3ft wide—we have more of those). The bulletin board pieces must include a background and applied pieces, all of which must be laminated. To the extent possible, the bulletin board should be assembled in a permanent fashion (e.g., put lettering down before laminating it) so that it can be reused easily.
   2. A standing center using a tri-fold foam-core display (like are used in science fairs). The same parameters apply as with the bulletin board, except that it is not expected that you’ll laminate the tri-fold itself. Construction should be generally permanent.
   3. A shelf display for the case in the hallway outside of TETC 182. These shelves are approximately 1ft.(deep) x 2.5ft. (wide) x 1.5ft.(tall). As above, as much as possible the pieces of this should be developed to be permanent.

Whichever option you choose, the visual display must be:

* 1. Interactive in some way—that is, calling on the student to interact physically or mentally with the display—perhaps by moving some part(s), answering some questions, arranging items, making observations over time, and so on.
  2. Well-crafted—for example, letters should be stenciled, cut carefully or drawn with care. Pictures should be carefully drawn, make use of photos and/or appropriate clip art and be purposeful (in most cases, some pure decoration is OK).
  3. Fitting to the topic of your activity—while the display does NOT have to be used in the lesson you design, it should support an ongoing engagement with the ideas in some way. For example, you might use the display in the lesson, and then leave it out for the children to interact with later. Or, you might not use the display in the lesson, but put it out in the room after the lesson is done so that the students continue to engage with the ideas in a different way.

1. You will develop a complete **materials list** for this lesson. You will have a (pretend) $50 budget to support this activity (no, you don’t get to spend money for real). For all of the materials that cannot commonly be purchased by a teacher locally, you will locate a source in a science supply catalog and develop an invoice within a $50 budget. You MUST use as much of the money as you can in order to enhance your lesson in meaningful ways. You can use online catalogs, or those I provide, but you must complete an **order form** from every vendor you use (be sure to think about shipping costs!).
2. You will visit the Wicomico County Instructional Resource Center to prepare the materials you need for the lesson and the display. You will go twice. First you will go for an orientation (it takes about 30 minutes) during which you’ll find out about what the Center has to offer.
3. You will prepare a 5 minute oral class presentation of your lesson that tells at least:
   1. What activity you started with, and why it was not inquiry-based
   2. How you changed the activity so it was inquiry-based
   3. How your visual display supports the lesson based on the activity

You must hand in three parts, which will each come in on **different dates**:

Part I: (10 pts.)

1. Copy/Printout of the activity you found (Include a citation of the source using APA format).

b. An explanation as to why this activity is NOT inquiry-based that relates to the attributes we use in class (relevant question, science processes, inductive approach.)

Part II: (50 pts.)

1. Science background explanation (1 or 2 pages) with sources properly cited
2. Materials list for your lesson

c. Your altered lesson for Inquiry (with Maryland Voluntary State Curriculum Standards)

1. An explanation as to why the activity IS now inquiry-based (identifying changes)
2. A discussion as to naïve conceptions that might arise when addressing this topic
3. An explanation identifying student challenges (diverse learners)
4. Catalog order form using as much of your $50 budget as possible

*NOTE: You MUST turn in Part I again stapled to the BACK of part 2 with my comments and grade*

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Part III: (40 pts.)

a. Set up your visual display prior to your presentation (unless I tell you otherwise)

b. Class presentation which showcases the lesson and your visual project